Early Journal Content on JSTOR, Free to Anyone in the World

This article is one of nearly 500,000 scholarly works digitized and made freely available to everyone in the world by JSTOR.

Known as the Early Journal Content, this set of works include research articles, news, letters, and other writings published in more than 200 of the oldest leading academic journals. The works date from the mid-seventeenth to the early twentieth centuries.

We encourage people to read and share the Early Journal Content openly and to tell others that this resource exists. People may post this content online or redistribute in any way for non-commercial purposes.

Read more about Early Journal Content at http://about.jstor.org/participate-jstor/individuals/early-journal-content.

JSTOR is a digital library of academic journals, books, and primary source objects. JSTOR helps people discover, use, and build upon a wide range of content through a powerful research and teaching platform, and preserves this content for future generations. JSTOR is part of ITHAKA, a not-for-profit organization that also includes Ithaka S+R and Portico. For more information about JSTOR, please contact support@jstor.org.

# PINK INSECT MUTANTS

WILLIAM MORTON WHEELER

THE present wide-spread interest in mutation lends fresh significance to the cases of dichromatism and trichromatism among insects, and suggests experiments in breeding these animals under laboratory control. The sporadic occurrence of pink individuals among our commonly leaf-green katydids (Locustidae) belonging to the sub-families Phaneropterinae and Pseudophyllinae, and especially in our two species of Amblycorypha, has been known for some years. Scudder called attention to some of these individuals in three brief papers (1878, 1897, 1901), and published a fine colored figure of a pair of them on a spray of golden rod.[1] From time to time other authors have recorded similar observations. Certain Homoptera, as I shall show presently, also exhibit color aberrations of the same kind. The following are the cases of pink Locustidae of which I find records in the literature:

### *Cyrtophyllus perspicillatus* L.

No. 1. A single specimen taken at Point Pleasant, N. J. Sex and date of capture not mentioned (Lewis 1883).

### *C. roseus* Stål.

No. 2. The type of the species from Chiriqui, Costa Rica, cited by Scudder (1901).

### *Amblycorypha rotundifolia* Scudder.

No. 3. Female, taken August 29, on Sharp Mountain, Schuylkill County, Pa. Recorded by Scudder (1878) who received it from Leidy.

---

[1] Entomol. News, XII, 1901, Pl. VI. This plate is reproduced by Blatchley (1902).

No. 4. A single specimen from Pennsylvania. Date and sex not recorded (von Wattenwyl, 1878).

### *A. oblongifolia* DeGeer

No. 5. Female, taken by Professor G. Thurber, presumably in New York State (Riley 1874).

No. 6. Specimen without record of date, sex or locality (Johnson 1889).

No. 7. Female, taken August 9, at Woods Hole, Mass., by Mrs. Sidney I. Smith (Scudder 1897).

Nos. 8 and 9. A male and a female specimen taken August 29, at Woods Hole, Mass., by Mr. Richard Rathbun and Professor A. E. Verrill (Scudder 1897, 1901).

Nos. 10 and 11. Two individuals belonging to a "number of pink specimens" taken near Bass Lake, Starke County, Indiana, by Mr. Frank Hay. Sex and date not recorded (Blatchley 1902).

Nos. 11 to 14. Three female specimens taken many years ago at West Farms, now a part of New York City, by Mr. J. Angus (American Museum of Natural History).

Nos. 15 to 17. Three specimens taken on Staten Island, N. Y., by Mr. William T. Davis. Two of these, both females, captured during August and September, are in Mr. Davis's collection.

No. 18. Female taken August 22, 1906, at Upper Montclair, N. J., by Mr. C. B. Wolff (American Museum of Natural History).

Nos. 19 to 23. Five females taken during August 1906, at Woods Hole, Mass., by members of the Marine Biological Laboratory (Professor T. H. Morgan *in litt.*).

No. 24. Male taken August 12, 1906, on Grosse Isle near Detroit, Mich., by Mr. A. S. Austin (Shull 1907).

No. 25. Female in the Museum of the University of Michigan. Date and locality not recorded (Shull 1907).

No. 26. Female taken August 31, 1907, at Winslow, N. J., by Mr. H. H. Halsted (American Museum of Natural History).

### *Conocephalus rosaceus* Walker

No. 27. Female, the type of the species, from North China, in the British Museum (Walker 1869).

It will be noticed that the geographical range of the pink *Amblycorypha oblongifolia* is nearly or quite co-extensive with that of the green form, and that the great majority of pink individuals enumerated in the list are females. This may be due either to the females of the species in general being more numerous than the males, or to the males being much shorter-lived than the females. Careful comparison of the pink with the common green forms fails to reveal any differences, except those of pigmentation. The color of all the aberrant specimens of *Amblycorypha oblongifolia* which I have seen, is very constant, although some of those seen by others have been described as vermilion or crimson. The exquisite tint of the living insect changes rapidly after death and becomes a dull pinkish brown in the cabinet. In green individuals, however, the post-mortem color change is less marked, so that we are justified in saying that the pink pigment is less stable than the green.

The pink katydids which have been observed in confinement show nothing unusual in their behavior, nor anything to suggest a diseased or abnormal condition. Those observed both by Scudder (1901) and myself ate green leaves and drank water with avidity, and eventually laid eggs of the normal form and size. Nos. 17 and 25 each lived in a jar in my laboratory for nearly six weeks. I endeavored to mate No. 17 with a male of the green form, but failed, perhaps because the experiment was tried too late in the season, or because the male may have been moribund or exhausted before it was placed in the jar with the female. The eggs laid by this insect a few days before her death were not fertilized. No. 25 had laid a number of eggs before she was sent to me by Mr. Halsted. According to Scudder (1878), specimen No. 3 oviposited while she was still in Leidy's possession.

It seems not to be generally known that, in addition to the green and pink forms, both *Amblycorypha rotundifolia* and *A. oblongifolia* have also a brown phase. Mr. William T. Davis has generously loaned me two males of the latter species in this phase, one taken by him July 24, at Hewitt, N. J., and the other during September, on Staten Island. In these I can detect no peculiarities except those of color, the usual green being merely replaced by a yellowish brown or tan tint, which was probably more vivid in the living specimens. Several authors have recorded the occurrence of both green and brown individuals in some of our species of cone-headed grasshoppers (*Conocephalus nebrascensis* Bruner, *C. robustus* Scudder), which are not known to have a pink phase, although Walker (1869) has based his *C. rosaceus* on a pink individual of this genus from Northern China. In *C. robustus* the brown and green colors are occasionally found in the same individual, a condition that, to my knowledge, has never been met with in the species of Amblycorypha.[1]

I find that certain green species of Homoptera belonging to the families Jassidae and Fulgoridae occasionally present striking color aberrations comparable to those of the Locustidae. Ball (1900) described as var. *paeta* a red individual of the green Jassid *Macropsis laeta* Uhler and noticed its resemblance to the pink phase of the katydids. Mr. William T. Davis has loaned me series of specimens of the jassid *Gypona geminata* Osborn, and of the fulgorid *Amphiscepa bivittata* Say which are of peculiar interest in this connection. The Gypona series comprises three specimens of the common green phase taken September 6, at Lakehurst, N. J., three brown individuals taken at the same time and place, and two pink specimens from Staten Island (September 11). There is also in the collection of the American Museum of Natural History a pink individual of the same species taken by Mr. J. Angus, at West Farms, N. Y. On closer examination the ventral surface and ground color of the pink specimens is seen to be greenish yellow (probably green in life), with irregular crimson markings on the head and thorax, and elytral veins of the same color. In the other specimens the brown and green colors are more diffused over the whole surface, especially on the dorsum, and there are no distinct markings on the head, thorax and elytra. The common form of the well-known *Amphiscepa bivittata* is pea-green, with the head, sides of thorax and scutellum, the posterior margins of the elytra and wings and the anterior legs, purplish brown. A single specimen in Mr. Davis's series has the green portions of the dorsal surface and elytra replaced by pink, with the veins of the latter somewhat purplish. This specimen, which is somewhat smaller than the green ones, was taken August 9 on Staten Island, by Mr. Joutel.

---

[1] Mr. Davis has shown me brown specimens of the following seven species which also present a green phase: *Conocephalus fuscostriatus* Redt., *ensiger* Harris, *lyristes* Rehn., *triops* L., *robustus* Scud., *candellianus* Davis, *exilis canorus* Davis.

What is the significance of these peculiar pink and brown forms which appear so sporadically among our green Orthoptera and Homoptera? As Scudder says, everyone who sees one of these rare insects for the first time, "thinks at once of autumn leaves and their changes from green to red, and notices that these grasshopper cases all occur in the autumn, so far as known." But further reflection soon leads one to doubt a conclusion based on such a superficial analogy, for it is evident, in the first place, that the colors of these insects must differ greatly from chlorophyll or other plant pigments, and, in the second place, the occurrence of the pink individuals during late summer may have no significance, since it is only during this season that even those of the common green phase reach full maturity. In this connection, Scudder (1901) also calls attention to the occurrence of *Cyrtophyllus roseus* in tropical Costa Rica.

There is, however, another fact hitherto unrecorded, which seems to me effectually to dispel the notion that the pink phase can be the result of temperature acting on the green pigment. Some years ago, while I was sweeping the low vegetation in the prairies of Wisconsin and Illinois for small Diptera, I took in my net, on one or two occasions during July, a few pink larval and nymphal katydids. Unfortunately I did not preserve the specimens as I was at that time collecting Diptera only, but I retain in my memory a vivid picture of the specimens. They varied from one to two centimeters in length, and were either wingless or had small rudiments of wings. They were pink throughout, like the adults which I have seen since, and occurred sporadically in the same sweepings with many specimens of the common green form. These larval and nymphal individuals show that the pink katydid is pink throughout life and this is in all probability true *mutatis mutandis* of brown individuals and of the pink and brown Homoptera also. In other words, the pinkness or brownness are, like the greenness, congenital or germinal characters and not the result of environmental conditions. This being the case, we must incline to the hypothesis advocated by Scudder and Shull, that the pink, and probably the brown individuals also, represent sports, or mutants, as we should now call them. They have, in fact, every appearance of belonging to a category of color forms similar to that of the albino mammals and birds and certain kinds of white-flowering plants. If there were need of coining new words, we might call the pink individuals cases of *rhodism* and the brown ones cases of *phaeism.*

Conclusive proof of the correctness of this view can be obtained only by experimental breeding. On the sport or mutation hypothesis we should expect pink individuals mated *inter se* to produce only pink individuals, and the same should result *mutatis mutandis* in the case of the brown forms. Pink or brown individuals crossed with the common green form may be expected to give offspring in the Mendelian proportion, with the pink and brown characters acting as recessives. Perhaps some student at the Marine Biological Laboratory at Woods Hole, where pink individuals of *Amblycorypha oblongifolia* seem to be less rare than in other localities, may find it worth while to perform these and other experiments for the purpose of determining the inheritance value of the characters above discussed.

## *Postscript*

Since the foregoing paragraphs were sent to the "Naturalist" two additional captures of pink *Amblycorypha oblongifolia* have been recorded:

No. 28. A female taken August 15, 1907, by Dr. J. N. Rose, in the New York Botanical Garden and presented to the National Museum, is cited by Knab (1907), who also mentions two brown specimens of this same species, one from Springfield, Mass., and another from Dorsey, Md. (August 20, Miss R. Jones). Knab calls attention to the pink and green caterpillars of the same species as analogous to the pink and green katydids, and concludes that the difference in pigmentation in the latter is in all probability due to the red or green coloring matter of the leaves on which the insects feed. I am unable to accept this view for the following reasons: first, red and green caterpillars are sometimes found on the same green plant and living under precisely the same conditions; second, my pink katydids in confinement ate green leaves for several weeks without showing the slightest change in coloration, and third, red vegetation is not abundant early in August, and katydids, unlike caterpillars, roam about, feeding on a variety of plants and even on animal food.

No. 29. A pink male *Amblycorypha oblongifolia* was captured by Grossbeck (1907) August 1, at Lahaway, Ocean County, N. J. He also mentions several pink specimens taken some years ago by Professor J. B. Smith in the pine barrens of New Jersey, and a pink *Amphiscepa bivittata* taken August 23, by himself at Lakehurst, N. J. He says that in his experience *Gypona octolineata* (perhaps identical with the species above cited as *G. geminata*) "is almost as often pink as green." The title of Grossbeck's paper shows that he regards the pink phases of these various insects as sports, or mutants, and not as the result of the environmental conditions (temperature, food, etc.).

## LITERATURE

BALL, E. D.

**1900.** Notes on the species of Macropsis and Agallia of North America. *Psyche,* 1900, p. 130.

BLATCHLEY, W. S.

**1902.** The Orthoptera of Indiana. *Twenty-seventh Rep. Dept. Geol. and Nat. Resources of Indiana,* 1902, pp. 351, 352. Pl.

GROSSBECK, J. A.

**1907.** Color Sports Among the Insects. *Science,* N. S. XXVI, Nov. 8, 1907, pp. 639, 640.

JOHNSON, L. N.

**1889.** Color of Katydid. *Science,* XIII, 1889, p. 32.

KNAB, F.

**1907.** Color Varieties of Locustidæ. *Science,* N. S. XXVI, Nov. 1, 1907, pp. 595–597.

LEWIS.

**1883.** Change of Color in a Katydid. *Proc. Acad. Nat. Sci. Phila.,* 1883, p. 44.

RILEY, C. V.

**1874.** Sixth Annual Report on the Noxious, Beneficial and other Insects of Missouri, 1874, p. 169.

SCUDDER, S. H.

**1878.** A Cardinal Grasshopper. *Psyche,* II, 1878, p. 189.

Scudder, S. H.
**1897**. Pink Locustarians. *Psyche,* VIII, 1897, pp. 54, 55.
Scudder, S. H.
**1901**. Pink Grasshoppers. *Entomol. News,* XII, 1901, pp. 129–131, Pl. VI.
Shull, A. F.
**1907**. A Color Sport among the Locustidae. *Science,* N. S. XXVI, 1907, pp. 218, 219.
Walker, F.
**1869**. Catalogue of the Specimens of Dermaptera Saltatoria in the Collection of the British Museum, London, 1869, pp. 321, 322.
von Wattenwyl, Brunner.
**1878**. Monographie der Phaneropteriden 1878, p. 269.